

We claim:

- 1 1. A machine-readable medium that provides instructions, which when executed by a set
2 of processors, cause said set of processors to perform operations comprising:
3 provisioning a non-BLSR protected layer 2/3 channel over a BLSR;
4 provisioning a tunnel over the BLSR; and
5 protecting the non-BLSR protected layer 2/3 channel between a first and second node
6 of the BLSR with the tunnel.

- 1 2. The machine-readable medium of claim 1 wherein the tunnel is a multi-protocol label
2 switching (MPLS) tunnel.

- 1 3. The machine-readable medium of claim 1 further comprising provisioning a second
2 tunnel on the BLSR, the second tunnel to protect the non-BLSR protected layer 2/3 channel
3 between the first node and a second node of the BLSR.

- 1 4. The machine-readable medium of claim 1 further comprising provisioning a second
2 tunnel on the BLSR, the second tunnel to protect the non-BLSR protected layer 2/3 channel
3 between a third node and a fourth node of the BLSR.

- 1 5. A machine-readable medium that provides instructions, which when executed by a set
2 of processors, cause said set of processors to perform operations comprising:
3 inhibiting automatic protection switching on a set of physical channels, the set of
4 physical channels corresponding to a first fiber;
5 creating a logical working interface and associating the logical working interface to a
6 first physical port, the physical port connecting to the first fiber;
7 creating a logical protecting interface and associating the logical protecting interface
8 to a second physical port, the second physical port connecting to a second
9 fiber;

10 associating the logical working and logical protecting interfaces to a forwarding
11 interface, the forwarding interface corresponding to a node;
12 setting the forwarding interface to refer to the logical working interface while the
13 fiber is not failing; and
14 modifying the forwarding interface to refer to the logical protecting interface while
15 the fiber is failing.

1 6. The machine-readable medium of claim 5 wherein the logical protecting interface
2 corresponds to a pre-provisioned tunnel.

1 7. The machine-readable medium of claim 5 wherein the logical protecting interface
2 corresponds to an MPLS tunnel.

1 8. The machine-readable medium of claim 5 further comprising establishing a tunnel
2 over a second fiber, the logical protecting interface being associated to the tunnel.

1 9. The machine-readable medium of claim 5 further comprising:
2 detecting failure of the first fiber; and
3 transmitting a message on the second fiber to a set of intermediate nodes, the message
4 indicating failure of the first fiber.

1 10. The machine-readable medium of claim 5 further comprising:
2 transmitting a first set of layer 2/3 traffic in the second physical port while the first
3 fiber is not failing; and
4 multiplexing the first set of layer 2/3 traffic with a second set of layer 2/3 traffic for
5 transmission in the second physical port while the first fiber is failing, the
6 second set of layer 2/3 traffic being transmitted in the first physical port while
7 the first fiber is not failing.

1 11. A machine-readable medium that provides instructions, which when executed by a set
2 of processors, cause said set of processors to perform operations comprising:

inhibiting automatic protection switching on a set of physical channels, the set of physical channels corresponding to a first fiber;

creating a logical working interface and associating the logical working interface to a first physical port, the physical port corresponding to the first fiber;

creating a logical protecting interface and associating the logical protecting interface to a tunnel, the tunnel corresponding to a second fiber;

associating the logical working and logical protecting interfaces to a forwarding interface, the forwarding interface corresponding to a node;

setting the forwarding interface to refer to the logical working interface while the fiber is not failing; and

modifying the forwarding interface to refer to the logical protecting interface while the fiber is failing.

The machine-readable medium of claim 11 wherein the tunnel is pre-provisioned over second fiber.

The machine-readable medium of claim 11 wherein the tunnel is an MPLS tunnel on the second fiber.

The machine-readable medium of claim 11 further comprising:
detecting failure of the first fiber; and
transmitting a message on the second fiber to a set of intermediate nodes, the message
indicating failure of the first fiber.

The machine-readable medium of claim 11 further comprising:
transmitting a first set of layer 2/3 traffic in the tunnel while the first fiber is not failing; and
multiplexing the first set of layer 2/3 traffic with a second set of layer 2/3 traffic for transmission in the tunnel while the first fiber is failing, the second set of layer 2/3 traffic being transmitted in the first physical port while the first fiber is not failing.

16. A network element comprising:

- a first fiber connecting the network element to a second network element;
- a second fiber connecting the network element to a third network element;
- a first optical processing circuitry coupled to the first fiber, the optical processing circuitry to transmit a first set of optical traffic in a first set of physical channels over the first fiber;
- a first egress layer 2/3 processing circuitry coupled to the first optical processing circuitry, the first egress layer 2/3 processing circuitry to transmit a set of layer 2/3 traffic to the first optical processing circuitry while the first fiber is not failing, the set of layer 2/3 traffic to be inserted into the first set of optical traffic;
- a second optical processing circuitry coupled to the second fiber, the second optical processing circuitry to transmit a second set of optical traffic in a second set of physical channels over the second fiber;
- a second egress layer 2/3 processing circuitry coupled to the second optical processing circuitry, the second egress layer 2/3 processing circuitry to transmit the set of layer 2/3 traffic to the second optical processing circuitry while the first fiber is failing, the set of layer 2/3 traffic to be inserted in to the second set of optical traffic;
- an ingress layer 2/3 processing circuitry coupled to the first and second egress layer 2/3 processing circuitry, the ingress layer 2/3 processing circuitry to receive and transmit the set of layer 2/3 traffic; and
- a control card coupled to the first and second optical processing circuitry and the ingress layer 2/3 processing circuitry, the control card to detect failure of the first fiber, to indicate failure of the first fiber to the ingress layer 2/3 processing circuitry, and to mask the first and second set of physical channels from automatic protection switching.

17. The network element of claim 16 wherein the set of layer 2/3 traffic is multiplexed with a second set of layer 2/3 traffic on the second egress layer 2/3 processing circuitry.

1 18. The network element of claim 16 further comprising a tunnel to carry the set of layer
2 2/3 traffic in the second set of physical channels while the first fiber is failing.

1 19. The network element of claim 16 further comprising an MPLS tunnel to carry the set
2 of layer 2/3 traffic in the second set of physical channels while the first fiber is failing.

1 20. The network element of claim 16 wherein the ingress layer 2/3 processing circuitry
2 includes:

3 a forwarding interface to forward traffic to the first network element;
4 a working interface coupled to the forwarding interface, the working interface to refer
5 to the first physical port; and
6 a protecting interface coupled to the forwarding interface, the protecting interface to
7 refer to the second physical port.

1 21. An apparatus comprising:

2 a first fiber connecting the network element to a second network element;
3 a second fiber connecting the network element to a third network element;
4 a first optical processing circuitry coupled to the first fiber, the optical processing
5 circuitry to transmit a first set of optical traffic in a first set of physical
6 channels over the first fiber;

7 a first egress layer 2/3 processing circuitry coupled to the first optical processing
8 circuitry, the first egress layer 2/3 processing circuitry to transmit a set of layer
9 2/3 traffic to the first optical processing circuitry while the first fiber is not
10 failing, the set of layer 2/3 traffic to be inserted into the first set of optical
11 traffic;

12 a second optical processing circuitry coupled to the second fiber, the second optical
13 processing circuitry to transmit a second set of optical traffic in a second set of
14 physical channels over the second fiber;

15 a second egress layer 2/3 processing circuitry coupled to the second optical processing
16 circuitry, the second egress layer 2/3 processing circuitry to tunnel the set of
17 layer 2/3 traffic and to pass the set of layer 2/3 traffic to the second optical

processing circuitry while the first fiber is failing, the set of layer 2/3 traffic to be inserted in to the second set of optical traffic; an ingress layer 2/3 processing circuitry coupled to the first and second egress layer 2/3 processing circuitry, the ingress layer 2/3 processing circuitry to receive and transmit the set of layer 2/3 traffic; and a control card coupled to the first and second optical processing circuitry and the ingress layer 2/3 processing circuitry, the control card to detect failure of the first fiber, to indicate failure of the first fiber to the ingress layer 2/3 processing circuitry, and to mask the first and second set of physical channels from automatic protection switching.

22. The network element of claim 21 wherein the set of layer 2/3 traffic is multiplexed with a second set of layer 2/3 traffic on the second egress layer 2/3 processing circuitry.

23. The network element of claim 21 wherein the tunnel of the set of layer 2/3 traffic is with MPLS.

24. The network element of claim 21 wherein the ingress layer 2/3 processing circuitry includes:

- a forwarding interface to forward traffic to the first network element;
- a working interface coupled to the forwarding interface, the working interface to refer to the first physical port; and
- a protecting interface coupled to the forwarding interface, the protecting interface to refer to the second physical port.

25. A computer implemented method comprising:
provisioning a non-BLSR protected layer 2/3 channel over a BLSR;
provisioning a tunnel over the BLSR; and
protecting the non-BLSR protected layer 2/3 channel between a first and second node
of the BLSR with the tunnel.

1 26. The computer implemented method of claim 1 wherein the tunnel is a multi-protocol
2 label switching (MPLS) tunnel.

1 27. The computer implemented method of claim 25 further comprising provisioning a
2 second tunnel on the BLSR, the second tunnel to protect the non-BLSR protected layer 2/3
3 channel between the first node and a second node of the BLSR.

1 28. The computer implemented method of claim 25 further comprising provisioning a
2 second tunnel on the BLSR, the second tunnel to protect the non-BLSR protected layer 2/3
3 channel between a third node and a fourth node of the BLSR.

1 29. A computer implemented method comprising:
2 inhibiting automatic protection switching on a set of physical channels, the set of
3 physical channels corresponding to a first fiber;
4 creating a logical working interface and associating the logical working interface to a
5 first physical port, the physical port connecting to the first fiber;
6 creating a logical protecting interface and associating the logical protecting interface
7 to a second physical port, the second physical port connecting to a second
8 fiber;
9 associating the logical working and logical protecting interfaces to a forwarding
10 interface, the forwarding interface corresponding to a node;
11 setting the forwarding interface to refer to the logical working interface while the
12 fiber is not failing; and
13 modifying the forwarding interface to refer to the logical protecting interface while
14 the fiber is failing.

1 30. The computer implemented method of claim 29 wherein the logical protecting
2 interface corresponds to a pre-provisioned tunnel.

1 31. The computer implemented method of claim 29 wherein the logical protecting
2 interface corresponds to an MPLS tunnel.

1 32. The computer implemented method of claim 29 further comprising establishing a
2 tunnel over a second fiber, the logical protecting interface being associated to the tunnel.

1 33. The computer implemented method of claim 29 further comprising:
2 detecting failure of the first fiber; and
3 transmitting a message on the second fiber to a set of intermediate nodes, the message
4 indicating failure of the first fiber.

1 34. The computer implemented method of claim 29 further comprising:
2 transmitting a first set of layer 2/3 traffic in the second physical port while the first
3 fiber is not failing; and
4 multiplexing the first set of layer 2/3 traffic with a second set of layer 2/3 traffic for
5 transmission in the second physical port while the first fiber is failing, the
6 second set of layer 2/3 traffic being transmitted in the first physical port while
7 the first fiber is not failing.

1 35. A computer implemented method comprising:
2 inhibiting automatic protection switching on a set of physical channels, the set of
3 physical channels corresponding to a first fiber;
4 creating a logical working interface and associating the logical working interface to a
5 first physical port, the physical port corresponding to the first fiber;
6 creating a logical protecting interface and associating the logical protecting interface
7 to a tunnel, the tunnel corresponding to a second fiber;
8 associating the logical working and logical protecting interfaces to a forwarding
9 interface, the forwarding interface corresponding to a node;
10 setting the forwarding interface to refer to the logical working interface while the
11 fiber is not failing; and
12 modifying the forwarding interface to refer to the logical protecting interface while
13 the fiber is failing.

1 36. The computer implemented method of claim 35 wherein the tunnel is pre-provisioned
2 over the second fiber.

1 37. The computer implemented method of claim 35 wherein the tunnel is an MPLS tunnel
2 over the second fiber.

1 38. The computer implemented method of claim 35 further comprising:
2 detecting failure of the first fiber; and
3 transmitting a message on the second fiber to a set of intermediate nodes, the message
4 indicating failure of the first fiber.

1 39. The computer implemented method of claim 35 further comprising:
2 transmitting a first set of layer 2/3 traffic in the tunnel while the first fiber is not
3 failing; and
4 multiplexing the first set of layer 2/3 traffic with a second set of layer 2/3 traffic for
5 transmission in the tunnel while the first fiber is failing, the second set of layer
6 2/3 traffic being transmitted in the first physical port while the first fiber is not
7 failing.